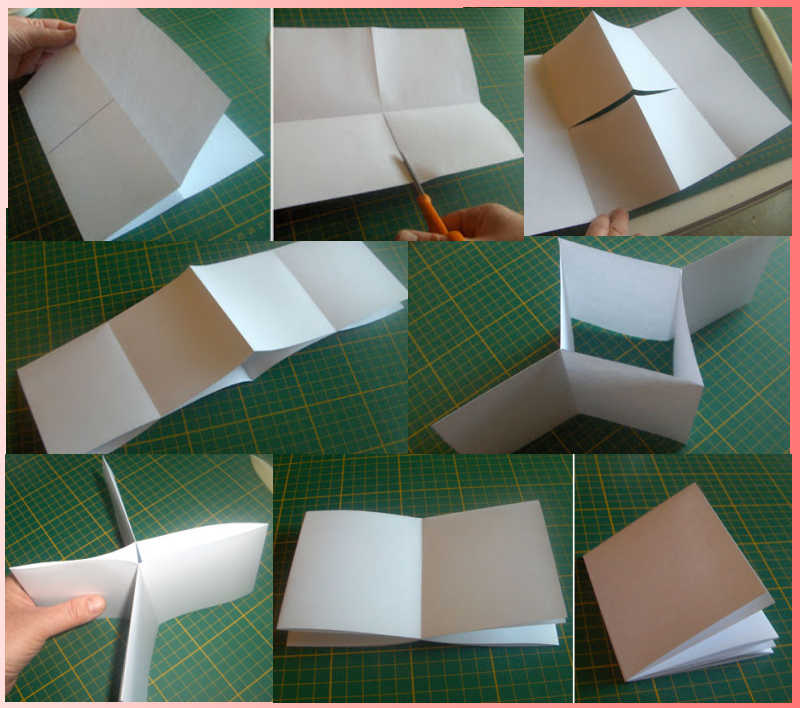


Factoring

with a leading coefficient of 1

Leading coefficient: the a in ax^2+bx+c

Monomial: one term polynomial

Binomial: two term polynomial

Trinomial: three term polynomial

Factoring means to rewrite a polynomial as a product of prime factors. It is how you change from standard form...

ax^2+bx+c

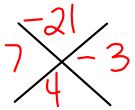
into intercept form...

$a(x-p)(x-q)$

Example 1 Factoring ax^2+bx+c when $a=1$

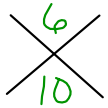
Step 1: If a≠1, then factor out the GCF if possible
Step 2: Find the factors of ac that add to equal b
Step 3: Use them to rewrite in intercept form $a(x-p)(x-q)$

A] $x^2+4x-21$



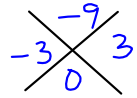
$(x+7)(x-3)$

B] $x^2+10x+6$



Does not factor

C] x^2-9 x^2+0x-9



$(x-3)(x+3)$

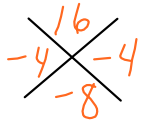
D] $2x^2-10x-28$ GCF=2

$2(x^2-5x-14)$

$2(x+2)(x-7)$

E] $2x^2-16x+32$ GCF=2

$2(x^2-8x+16)$



$2(x-4)(x-4)$

$2(x-4)^2$

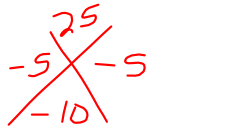
F] $5x^2-25x$ GCF=5x

$5x(x-5)$

Already factored completely

On your whiteboard...

A] $x^2 - 10x + 25$

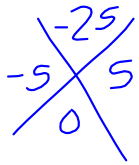


$(x-5)(x-5)$

$(x-5)^2$

B] $x^2 - 25$

$x^2 + 0x - 25$



$(x-5)(x+5)$

C] $2x^2 + 20x - 50$ GCF = 2

$2(x^2 + 10x - 25)$

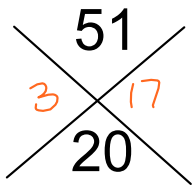
Does not factor

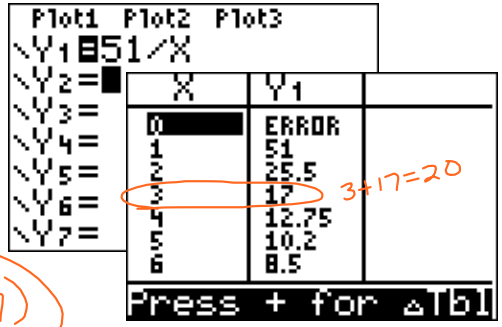
Example 2 Factoring ax^2+bx+c when a=1 with big numbers

Step 1: If $a \neq 1$, then factor out the GCF if possible
Step 2: Find the factors of ac that add to equal b
Step 3: Use them to rewrite in intercept form $a(x-p)(x-q)$

A] $3x^2+60x+153$ GCF = 3

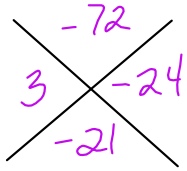
$3(x^2+20x+51)$



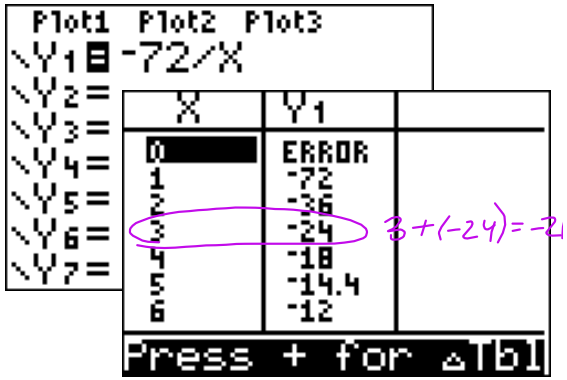


$3(x+3)(x+17)$

B] $x^2-21x-72$



$(x+3)(x-24)$

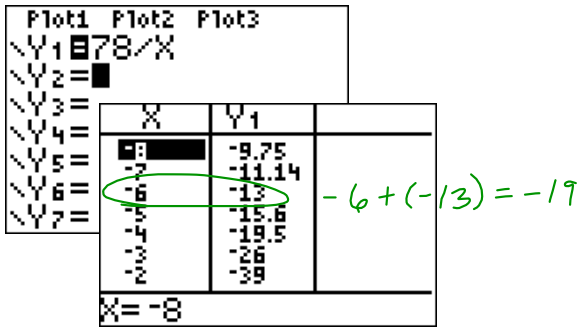


On your whiteboard...

Factor $x^2 - 19x + 78$

78
-6 × -13
-19

$(x-6)(x-13)$



Example 3 Using factoring to solve equations

1. Rewrite in standard form so the quadratic equation is equal to zero.
2. Factor completely.
3. Set each factor equal to zero and solve for x.

*Recall the Zero product Property says anything times 0 equals 0.

A] $x(x+2)=6+x$

$x^2+2x=6+x$
$-x \quad -x$
$x^2+x=6$
$-6 \quad -6$
$x^2+x-6=0$ ← Standard form = to 0 so now you can factor

-6, 3×-2, 1

$(x+3)(x-2)=0$

$x+3=0$: $-3 \quad -3$: $x=-3$

$x-2=0$: $+2 \quad +2$: $x=2$

Check!

$x(x+2)=6+x$

$-3(-3+2)=6+(-3)$
$-3(-1)=6-3$
$3=3$ ✓

$2(2+2)=6+2$
$2(4)=8$
$8=8$ ✓

B] $(x+3)^2=-2(x+3)$

$(x+3)(x+3)=-2(x+3)$

$x^2+6x+9=-2x-6$
$+6 \quad +6$
$x^2+6x+15=-2x$
$+2x \quad +2x$
$x^2+8x+15=0$ ← Standard form = to 0 so now you can factor

15, 5×3, 8

$(x+5)(x+3)=0$

$x+5=0$: $-5 \quad -5$: $x=-5$

$x+3=0$: $-3 \quad -3$: $x=-3$

Check!

$(x+3)^2=-2(x+3)$

$(-5+3)^2=-2(-5+3)$
$(-2)^2=-2(-2)$
$4=4$ ✓

$(-3+3)^2=-2(-3+3)$
$(0)^2=-2(0)$
$0=0$ ✓

On your whiteboard...

Solve the quadratic equation by factoring.

$$x^2 - 16 = -2(x - 16)$$

$x^2 - 16 = -2x + 32$

$-32 \qquad -32$

$x^2 - 48 = -2x$

$+2x \qquad +2x$

$x^2 + 2x - 48 = 0$

-48

8×-6

2

$(x+8)(x-6) = 0$

$x + 8 = 0$

$x = -8$

$x - 6 = 0$

$x = 6$

Check!

$(-8)^2 - 16 = -2(-8-16)$

$64 - 16 = -2(-24)$

$48 = 48$ ✓

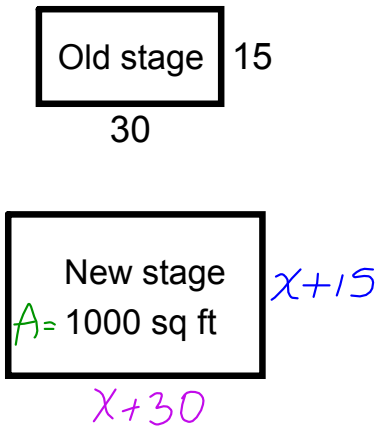
$6^2 - 16 = -2(6-16)$

$36 - 16 = -2(-10)$

$20 = 20$ ✓

Example 4 Application problem

The old stage at the high school was 15x30 feet. It was expanded by adding the same distance, x, to the width and length of the old stage dimensions. The new stage has a total area of 1000 sq feet. What are the dimensions of the new stage?



Area = Length (width)

$1000 = (x+30)(x+15)$

$1000 = x^2 + 45x + 450$

$-1000 \quad -1000$

$0 = x^2 + 45x - 550$

-550

$55 \quad -10$

45

$0 = (x+55)(x-10)$

$x = -55$ Not useful since length can't be negative.

$x = 10$ substitute back in for x to find dimensions

Length: $10+30 = 40$

Width: $10+15 = 25$

New stage is 25 x 40 feet

Basic Factoring Connect-4

Rules:

- One person gets a blue pencil and the other gets a red pencil.
- The person with the red pencil goes first. Pick a square and solve the quadratic equation by factoring. Write the factored form and the solutions in the box using the red pencil. Have your partner check your work. If it is correct, you win that square. If it is wrong, your partner wins that square and circles it in his/her color.
- The person with the blue pencil goes next. Then keep taking turns.
- The game is over when someone gets four in row (across, up/down, or diagonal).